

CLAIMS

1. A medical device for injecting medicinal fluid from a vial having a container and an amount of medicinal fluid, comprising:
 - a hollow barrel;
 - a socket associated with the barrel configured to receive the vial;
 - a needle having a sharpened tip operable between an exposed position in which the sharpened tip projects forwardly from the barrel and a shielded position in which the sharpened tip is shielded from contact; and
 - a transfer chamber within the barrel for receiving the medicinal fluid from the vial, wherein the transfer chamber is adapted to be in fluid communication with the needle;wherein after use, the needle is disposed in the shielded position.
2. The medical device of claim 1 comprising a transfer conduit configured to extend between the vial and the transfer chamber for transferring medicine from the vial to the transfer chamber.
3. The medical device of claim 1 comprising a vial holder engaging the barrel, wherein the socket is formed in the vial holder.
4. The medical device of claim 3 wherein the vial holder is at least partially disposed within the barrel.
5. The medical device of claim 3 wherein the vial holder is displaceable within the barrel.
6. The device of claim 3 comprising an air-pump chamber disposed within the vial holder, and a piston operable to pump air from the air pump chamber into the vial to pressurize the fluid in the vial.

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7. The device of claim 3 comprising a lock releasably locking the vial holder and the barrel to prevent relative motion between the vial holder and the barrel.
8. The medical device of claim 1 comprising a piston for expelling medicine out of the transfer chamber through the needle.
9. The medical device of claim 8 comprising a vial holder engaging the housing, wherein the socket is formed in the vial holder and the vial holder is displaceable relative to the piston.
10. The medical device of claim 1 wherein the transfer chamber is displaceable relative to the needle.
11. The medical device of claim 1 comprising a valve adapted to control the flow of fluid between the transfer chamber and the vial.
12. The medical device of claim 11 wherein the valve is a sliding valve.
13. The medical device of claim 1 comprising a pierceable rear seal adapted to provide a fluid-tight seal between the vial and the transfer chamber.
14. The device of claim 1 comprising a pierceable forward seal providing a fluid-tight seal between the transfer chamber and the needle.
15. The device of claim 1 comprising a biasing element biasing the needle toward the shielded position.
16. The device of claim 15 comprising a needle retainer releasably retaining the needle in the exposed position against the bias of the biasing element.

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17. The device of claim 16 wherein the needle retainer is configured so that the needle is automatically released for retraction at the end of an injection.
18. The device of claim 1 comprising a piston operable to pump air into the vial to pressurize the fluid in the vial.
19. A medical device, comprising:
 - a vial containing a quantity of medicinal fluid, wherein the vial comprises a container having a fixed rearward wall and a fixed pierceable wall sealing the forward end;
 - a holder configured to receive the vial;
 - an injection needle for expelling the medicinal fluid from the device wherein the injection needle comprises a sharpened tip operable between an extended position in which the sharpened tip is exposed for use and a protected position in which the sharpened tip is shielded to prevent inadvertent contact with the sharpened tip; and
 - a communication path adapted to establish fluid flow between the vial and the injection needle to allow the medicinal fluid to flow from the vial to the injection needle;
 - wherein after use the needle is disposed in the protected position.
20. The device of claim 19 comprising a biasing element biasing the needle toward the retracted position.
21. The device of claim 20 comprising a needle retainer releasably retaining the needle in the extended position against the bias of the biasing element.
22. The device of claim 19 comprising a seal disposed along the communication path
23. The device of claim 22 wherein the seal is pierceable to allow the medicinal fluid to flow along the communication path.

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24. The device of claim 19 comprising a chamber for receiving the medicinal fluid from the vial, wherein the medicinal fluid is subsequently expelled from the chamber through the injection needle.
25. The device of claim 24 comprising a conduit extending between the vial and the chamber.
26. The device of claim 24 wherein the chamber is disposed in a first housing.
27. The device of claim 26 comprising a pierceable seal sealing an end of the chamber.
28. The device of claim 26 wherein the device comprises a second housing associated with the injection needle, wherein the first housing is displaceable relative to the second housing.
29. The device of claim 28 wherein displacing the first housing relative to the second housing operates to expel the medicinal fluid from the chamber through the injection needle.
30. The device of claim 28 comprising a stop for releasably impeding relative displacement between the first and second housings.
31. The device of claim 24 comprising a valve controlling the flow of medicinal fluid from the chamber.
32. The device of claim 19 comprising means for pressurizing the vial.
33. A method for injecting medicine, comprising the steps of:
providing a container having a quantity of medicinal fluid;
providing an injection device having a chamber and a needle;
attaching the container to the injection device;
transferring medicinal fluid from the container to the chamber;
expelling the medicinal fluid from the chamber; and

retracting the needle after expelling the medicinal fluid to shield the needle against contact.

34. The method of claim 33 wherein the step of expelling the medicinal fluid comprises expelling the medicinal fluid through the needle while the container is attached to the injection device.
35. The method of claim 33 comprising the step of automatically releasing the needle for retraction after substantially all of the medicinal fluid is expelled from the chamber.
36. The method of claim 33 comprising the step of pressurizing the container after the container is attached to the injection device.
37. The method of claim 33 comprising the step of sealing the chamber to impede the flow of medicinal fluid from the chamber to the vial during the step of expelling the medicinal fluid.
38. The method of claim 33 comprising the steps of:
sealing an end of the chamber; and
piercing the seal to allow fluid to flow from the chamber through the needle.
39. The method of claim 33 wherein the container comprises first and second ends that are fixed.
40. The method of claim 33 comprising the step of purging air from the chamber prior to expelling the fluid from the chamber.
41. A method for injecting medicine, comprising the steps of:
providing a container having a first fixed piercable end, a second fixed end and a quantity of medicinal fluid;
providing an injection device having a needle, wherein the injection device is adapted to mate with the container;
mating the container with the injection device;

expelling the medicinal fluid from the container through the needle; and retracting the needle after expelling the medicinal fluid to shield the needle against contact.

42. The method of claim 41 comprising the step of pressurizing the container after the container is mated with the injection device.
43. The method of claim 41 wherein the injection device comprises a chamber and the method comprises the step of transferring the medicinal fluid from the container to the chamber.
44. The method of claim 43 comprising the step of sealing the chamber to prevent medicinal fluid from flowing from the chamber to the vial during the step of expelling the medicinal fluid.
45. The method of claim 43 comprising the steps of:
sealing an end of the chamber; and
piercing the seal to allow fluid to flow from the chamber through the needle.
46. The method of claim 41 comprising the step of purging air from the injection device prior to expelling the fluid from the chamber.
47. The method of claim 41 wherein the step of expelling the medicinal fluid comprises expelling the medicinal fluid through the needle while the container is attached to the injection device.
48. The method of claim 41 comprising the step of automatically releasing the needle for retraction after substantially all of the medicinal fluid is expelled through the needle.
49. The method of claim 41 wherein the injection device comprises a first housing and a second housing, and the step of expelling comprised displacing the first housing relative to the second housing to expel the medicinal fluid.

50. The method of claim 41 comprising the step of biasing the needle toward a shielded position.
51. The method of claim 50 comprising the step of releasably retaining the needle against the bias.
52. The method of claim 41 wherein the step of expelling comprises expelling the medicinal fluid while the container is mated with the injection device.
53. The method of claim 41 wherein the step of expelling includes moving the container within the injection device.
54. A medical device cooperable with a needle assembly having a retractable injection needle and a pre-filled container of medicinal fluid, comprising:
a housing cooperable with the needle assembly;
a socket for receiving the container ;
a pressurizing element within the housing to provide positive fluid pressure within the container when the container is disposed in the socket;
a chamber in the housing for receiving the medicinal fluid from the container;
wherein the housing has an activation surface cooperable with the needle assembly and adapted to activate retraction of the needle after use.
55. The device of claim 54 comprising a piercable seal sealing the chamber.
56. The device of claim 55 comprising a conduit for providing a fluid path between the chamber and the vial when the container is disposed in the socket.

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57. The device of claim 54 comprising a fluid path extending between the container and the needle assembly when the needle assembly is attached to the housing and the container is disposed in the socket.
58. The device of claim 57 comprising a valve controlling the flow of fluid along the fluid path.
59. The device of claim 58 wherein the valve is a sliding valve.
60. The device of claim 54 comprising a stop for releaseably retaining the housing from displacement relative to the needle assembly when the needle assembly is connected with the housing.

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